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Energy Efficient Wireless Sensors in One Dimensional Network

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ABSTRACT

Wireless Sensor Networks offers a wide range of applications in areas such as traffic monitoring, medical care, inhospitable terrain, robotic exploration and agriculture surveillance. In wsn, thousands of physically embedded sensor nodes are distributed in possibly harsh terrain and in most applications, it is impossible to replenish energy via replacing batteries. In order to cooperatively monitor physical or environmental conditions. The main task of sensor nodes is to collect and transmit data. It is well known that transmitting data consumes much more energy than collecting data. The advent of efficient wireless communications and advancement in electronics has enabled the development of low-power, low-cost and multifunctional wireless sensor nodes that are characterized by miniaturization and integration. The main aim of this project is to effectively send the data (value added and original) using opportunistic routing algorithm and to improve energy efficiency in one dimensional network. Here we send the data to sink using one dimensional networks, so it cannot divert to other nodes. It will go directly to sink. Another process of route finding depends on its coverage. In this process effectively transfer the emergency data to the sink.

Keywords: Wireless Sensor Network, Opportunistic Routing, One Dimensional Network.

I. INTRODUCTION

Wireless sensor network (wsn) is used in many areas such as traffic monitoring, medical care, agriculture surveillance, inhospitable terrain and also in military purpose. The advancement in wireless sensor network leads to the development of low power, low cost and multifunctioning wireless sensor nodes. The purpose of sensor nodes is to sense the physical and environmental conditions.

The sensor node monitors and collects the data and then transmits the data to the destination. we know that transmitting data consumes more energy when compared to collecting data. There are number of sensor nodes that are distributed in harsh terrain. It is impossible to regain the energy consumed by replacing batteries. We cannot replenish energy but we can improve the efficiency of the energy. The existing routing protocol for energy efficiency finds the minimum path to transfer the data form source to destination. This achieves the optimal energy consumption. The designing method for energy efficiency routing protocol in case of wireless sensor network is multifold since it not only finds the minimum path to send the data but also involves in balancing the residual energy. The unreliable wireless links and the partition of network leads to packet loss and multiple retransmissions over the same path. Due to multiple retransmissions, it consumes more energy. Thus it is necessary to avoid this condition.

In this work, the one dimensional queue network is being focused. The one dimensional queue network is used in various applications such as industry works, civil works, pipeline monitoring, intelligent traffic monitoring etc. In this paper, opportunistic routing algorithm to save energy is proposed in one dimensional queue network. The energy equivalent node concept in opportunistic routing is used to select the relay nodes to derive transmission distance for saving energy and to maximize the lifetime throughout the network. To determine optimal transmission distance, it is important to derive the distance from source node to destination and the residual energy of individual sensor nodes. We also define the concept of energy equivalent node that is based on optimal transmission distance.

II. METHODS AND MATERIAL

A. Related Work

In this paper [1], a novel forwarding technique is proposed which is based on geographic location of the nodes and selecting the relay node randomly through contention among the receivers. Thus the multihop performance is focussed in which only the best relay node is chosen to transmit the data from source to destination. This is achieved in terms of average number of hops and average number of available neighbours. This performance is calculated by both analytical techniques and by simulation. In this novel forwarding technique that is based on geographic location of nodes, the packets are transmitted to the destination on a best effort basis. Here the intended receiver is not indicated. The receiver contention scheme guarantees that the single relay is chosen. Thus it avoids the packet duplication.

Another approach in the paper [2], Opportunistic routing has been shown to improve the network throughput, by allowing nodes that overhear the transmission and closer to the destination to participate in forwarding the packet. The nodes in *forwarder list* are prioritized and the lower priority forwarder will discard the packet if the packet has been forwarded by a higher priority forwarder.

One challenging problem is to select and prioritize forwarder list such that a certain network performance is optimized. In this paper, we focus on selecting and prioritizing forwarder list to minimize energy consumptions by all nodes. We study both cases where the transmission power of each node is fixed or dynamically adjustable. We present an energy efficient opportunistic routing strategy, denoted as EEOR. Our extensive simulations in TOSSIM show that our protocol EEOR performs better than the well-known ExOR protocol (when adapted in sensor networks) in terms of the energy consumption, the packet loss ratio, the average delivery delay.

In paper [3], In Wireless Sensor Networks (WSN), energy is a very precious resource for sensor nodes and communication overhead is to be minimized. So energy is an extremely critical resource for this type of battery-powered based Wireless Sensor Networks (WSN), and thus making energy-efficient smart protocol design is a key challenging problem. Some of the few existing energy-efficient routing protocols schemes always forward the packets through the minimum energy based optimal route to the sink to minimize energy consumption. It causes an unbalanced distribution of residual energy between sensor nodes, which leads to network partition. The prime goal of this approach is to forward packets to sink through the energy denser area to protect the nodes with less residual energy, which is maximizing the Sensor Networks Lifetime. The existing technique Energy Balanced Routing Protocol (EBRP) fails to achieve Throughput, End-to-End Delay, in order to improve the Network Performance. So the efficient routing protocol is needed with the capabilities of both the Energy Efficiency and Energy Balancing. To address these issues, we have proposed Delay Aware Energy Balanced Dynamic Routing Protocol (DA-EBDRP). The proposed routing technique achieves in terms of End-to-End Delay, Throughput, Portion of Living Node (PLN) and Network Lifetime. By simulation results the proposed algorithm achieves better performance than the existing methods. The sensor network is created using multiple number of similar nodes that are arranged in a densely manner. These sensors are used to monitor the data and transmit the data to the destination.

The paper [4] explains, The small battery capacity, ubiquity, and operational diversity of wireless micro sensor networks create unprecedented energy management challenges. The energy consumption of micro sensors is determined not only by the node's physical hardware, but also by the algorithms and protocols that impart functional demands on the hardware. We therefore present design methodologies that foster energy savings through collaboration across the hardware, algorithm, and network layers, in contrast to techniques that have explored only one of these spaces. For instance, dynamic voltage scaling is coupled with the intelligent distribution of within-network computation to extend latency deadlines and decrease supply voltages. The quality of communication is parameterized into metrics that drive the performance and energy consumption of the communication subsystem. Finally, the energy consumption of radios is carefully characterized to improve the efficiency of multihop routes. Collaboration between node software and hardware, and among the distributed nodes of the network, improve energy-efficiency and extend operational lifetime.

The distributed wireless micro sensor network is made up of several number of small sensor nodes and each sensor node is used to monitor, collect and transmit the data to the destination due to physical and environmental conditions. This type of sensors are used in various fields such as inhospitable terrain, robotic exploration, intelligent traffic monitoring and in other industrial and civilian applications. The microsensor nodes combine sensing processing and other communication subsystem. One of the advantages of sensor node is its size. Due to its small size, it is used in many applications.

Another approach in paper [5] describes, Wireless Integrated Network Sensors (WINS) provide distributed network and Internet access to sensors, controls, and processors that are deeply embedded in equipment, facilities, and the environment. The WINS network is a new monitoring and control capability for applications in transportation, manufacturing, health care, environmental monitoring, and safety and security. WINS combine microsensor technology, low power signal processing, low power computation, and low power, low cost wireless networking capability in a compact system. Recent advances in integrated circuit technology have enabled construction of far more capable sensors, radios, and processors at low cost, allowing mass production of sophisticated systems that link the physical world to networks Scales will range from local to global, with applications including medicine, security, factory automation, environmental monitoring, and condition-based maintenance. Compact geometry and low cost allows WINS to be embedded and distributed at a small fraction of the cost of conventional wireless sensor and actuator systems.

The opportunities for WINS depend on the development of scalable, low cost, sensor network architecture. This requires that sensor information be conveyed to the user at low bit rate with low power transceivers. Continuous sensor signal processing must be provided to enable constant monitoring of events in an environment. By coming to decisions on these events, short message packets suffice. Future applications of distributed embedded processors and sensors will require massive numbers of devices. Conventional methods for sensor networking would present impractical demands on cable installation and network bandwidth. Through processing at source, the burden on communication system components, networks, and human resources are drastically reduced.

In this, the sensor node allows calibration of real world data-gathering protocols and an understanding of factors that prevent these protocols from approaching fundamental limits. Second, the dependence of lifetime on factors like the region of observation, the source behavior within that region, base station location, number of nodes, radio path loss characteristics, efficiency of node electronics and the energy available on a node, is exposed. This allows architects of sensor networks to focus on factors that have the greatest potential impact on network lifetime. By employing a combination of theory and extensive simulations of constructed networks, we show that in all data gathering scenarios presented, there exist networks which achieve lifetimes equal to or >85% of the derived bounds. Hence, depending on the scenario, our bounds are either tight or near-tight. Rapid commoditization and increasing integration of micro-sensors, single node has led to the idea of distributed, wireless networks that have the potential to collect data more cost effectively, autonomously and robustly compared to a few macro-sensors

B. Existing System

In Wireless Sensor Networks (WSN), energy is a very precious resource for sensor nodes and communication overhead is to be minimized. So energy is an extremely critical resource for this type of battery-powered based on the Wireless Sensor Networks (WSN), and thus making energy-efficient smart protocol design is a key challenging problem.

Some of the few existing energy-efficient routing protocols schemes to transmit the data always forward the packets through the minimum energy based optimal route to the sink to minimize energy consumption. It causes an unbalanced distribution of residual energy between sensor nodes, which leads to network partition. Opportunistic routing has been shown to improve the network throughput, by allowing nodes that overhear the transmission and closer to the destination to participate in forwarding the packet, i.e., in forwarder list. The nodes in forwarder list are prioritized and the lower priority forwarder will discard the packet if the packet has been forwarded by a higher priority forwarder. One challenging problem is to select and prioritize forwarder list such that a certain network performance is optimized.

In existing system to improve the energy efficiency for transmitting data, most of the existing energy efficient routing protocols attempt to find the minimum energy path to transmit the data between source and destination and also to achieve the optimal energy consumption. To design energy efficient routing protocol, in case of sensor networks, is said to be mutifold. This is said to be multifold because it not only involves finding the minimum energy path to transmit the data from source to destination but also involves in balancing the distribution of residual energy throughout the network. Furthermore the unreliable wireless links and the network partition may cause packet loss and multiple retransmissions over the same preselected good path. Thus retransmitting the packet form source to the destination over the same preselected good path will inevitably induces significant energy cost and also consumes high energy. Therefore the traditional routing protocol chooses static path and the energy dissemination is not uniform thus leading to the network failure.

C. Drawbacks Of Existing System:

The drawbacks of existing system includes

(1) There is a packet data loss when transmitting the data from source to the destination. This is due to loss of energy when the packet that moves from one sensor to other sensor node in the wireless sensor network.
(2) Since there is a multiple retransmission over the same preselected good path, there is a more overhead in the network system. This will eventually leads to high consumption of power.
(3) There is a network break due to depletion. This is because of the partition of network in the wireless sensor nodes when transmitting the data from one sensor node to another sensor node.

One of the major disadvantages of the existing system is that, the importance of the data type is not evaluated in case of wireless sensor networks.

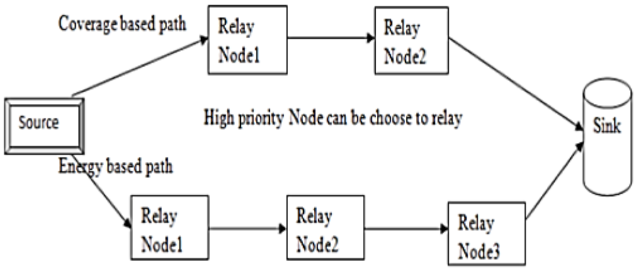
III. RESULTS AND DISCUSSION

A. Proposed System

Wireless sensor network offers a wide range of applications in areas such as traffic monitoring, medical care, inhospitable terrain, robotic exploration and agriculture surveillance. In wireless sensor network, thousands of physically embedded sensor nodes are distributed in possibly harsh terrain and in most applications it is impossible to replenish or regain energy by replacing batteries. Thus in order to cooperatively monitor physical and also the environmental conditions, the main task of sensor node is to monitor , collect and transmit the data from source to destination. It is well known that transmitting data consumes more energy when compared to monitoring and collecting the data. The advent of efficient wireless communications and advancement in electronics has enabled the development of low power and low cost and multifunctional wireless sensor nodes that are characterized by miniaturization and integration .the main aim of this project is to effectively send the data (both value added data and original data) using opportunistic routing algorithm and also to improve the energy efficiency in one dimensional network.

In this paper, we propose an energy efficient routing algorithm and coverage based routing algorithm. An opportunistic routing algorithm is proposed so as to choose the best routing path for the type of data to be forwarded. We estimate the forwarder list based on the distance to energy efficiency (energy equivalent node) and residual energy of each node. Here we send the data to the destination using one dimensional network. The one dimensional network is used in many applications such as industry and civilian works. And this one dimensional network cannot divert to other nodes, it will directly go to destination. Another process of rout finding is depending on its coverage. In this process, we effectively send the data from source to destination. There are two types of transmission of data.

(1) Ordinary data
(2) Value added data(Emergency data)



B. Modules

(1) Network formation and energy based route finding
(2) Distance based route finding
(3) Secure data transfer

- **Network Formation**

Each node sends “hello” message to other nodes which allows detecting it. Once a node detects the “hello” message from another node (neighbour node), it maintains a contact record to store information about the neighbour node. Using multicast socket, all nodes are used to detect the neighbour nodes. Once after finding the neighbour nodes, a queue is maintained for every individual neighbour node. This is called ad the real queue. The network formation is single dimensional, so it forwards the data only in forward direction. In neighbour nodes, it is divided into three regions. They are inner, middle and outer region that depends upon each sensor node. Thus the network is formed to transmit the data form source to destination.

- **Energy Based Route Finding**

In this process is residual energy based route finding process, every sensor node have a unique energy level. The highest energy level node is chosen as the data forwarder. The higher residual energy sensor nodes are forming the route from source to the destination. In the data transmission process the sensor nodes energy can be reduces depends upon the data length. The sensor node energy can be evaluating every data transmission. The sensor energy level cannot fully reduce because we can choose the sensor for each and every data transmission depends upon the residual energy.

- **Coverage Based Route Finding**

In this coverage based route finding process, every node has a coverage area that can be divided into inner region, Middle region and outer region. For example, coverage is divided into inner region(0-15),middle region(15-30),outer region(30-50).outer region node can be choosing to a forwarder .source can select the outer region as an intermediate to transmit the data’s. if outer region is not available to forward ,then we select the middle region node .in this technique the emergency data can be forward fast and effectively.

- **Secure Data Transfer**

In this module data is to be encrypted using RSA algorithm. if data is value added then choose the path(based on coverage technique)to send data’s .if the data is original then choose the path(based on energy level technique) to send data’s. After receiving the data in sink, the data is to be decrypted using RSA algorithm .in the process the relay nodes are forward the data to sink.

IV. CONCLUSION

Thus we designed, effectively send the data using opportunistic routing algorithm and also reduce minimising energy consumption and maximizing network lifetime of 1-d queue network where sensors’ locations are predetermined and unchangeable.

V. ACKNOWLEDGMENT

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VI. FUTURE ENHANCEMENT

Even though the data is transferred with energy efficiency in ordinary data, a small amount of energy is wasted in transferring data for emergency data. Thus we will concentrate more on saving energy while sending data for emergency data.

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